Curriculum Vitae Quanlin Zhou

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Education and Degrees

- 1996–1999, Technion-Israel Institute of Technology, Ph.D. in Civil & Environmental Engineering, Sept. 1999.
- 1987–1990, Hohai University, Nanjing, China, M.Eng. in Hydrology and Water Resources, July 1990
- 1983–1987, Hohai University, Nanjing, China, B. Eng. in Hydrology and Water Resources, July 1987

Professional Experience

- 11/2008–Present, Geological Research Scientist (Career), Lawrence Berkeley National Laboratory (LBNL), Berkeley, CA
- 06/2006–11/2008, Geological Research Scientist (Career-Track), LBNL, Berkeley, CA
- 06/2005–06/2006, Senior Modeler, ETIC Engineering Inc, Oakland, CA
- 09/2002–06/2005, Geological Scientist, LBNL, Berkeley, CA
- 03/2001–09/2002, Geological Postdoctoral Fellow, LBNL, Berkeley, CA
- 10/2000–03/2001, Postdoctoral Fellow, University of Wisconsin at Madison, Madison, WI
- 10/1999–09/2000, Postdoctoral Associate, Massachusetts Institute of Technology, Cambridge, MA
- 07/1990–10/1996, Senior Engineer (Engineer for 1990–1995), Nanjing Institute of Hydrology and Water Resources, Nanjing, China

Research Interests

- Numerical modeling of flow and contaminant transport in fractured/porous media, with applications to nuclear waste disposal, geologic carbon sequestration, and site-specific remediation
- Multiphase and unsaturated flow in heterogeneous fractured/porous media; preferential flow, lateral spreading, upscaling and effective properties
- Diffusive transport in fractured rock and layered porous media at small and field scales; behavior of field-scale effective diffusion coefficient for heterogeneous media; effective diffusion in unsaturated and multiphase flow conditions
- Geologic carbon sequestration: its impact on large-scale groundwater resources; enhanced storage capacity and security in natural hierarchical, multiscale, heterogeneous sedimentary rocks; early CO_2 leakage detection via real-time pressure monitoring and inverse modeling

- Characterization of large-scale contaminant plumes, with physical, chemical, microbial (biodegradation) processes; conceptual understanding with detailed data and inverse analysis in support of on-site remediation and natural attenuation
- Density-dependent flow for seawater intrusion and brine transport
- Coupled surface water and groundwater systems

Honors and Awards

- "Outstanding Performance Award", Lawrence Berkeley National Laboratory, 2007
- "The Miriam and Aaron Gutwirth Award", the Gutwirth Foundation, Israel, 1999.
- "The Irmay Prize", Technion-Israel Institute of Technology, Haifa, Israel, 1998.

Publications

Peer-Reviewed Journal Publications [Total SCI Citations: 67, h-index = 5]

J1 **Quanlin Zhou**, Jens T. Birkholzer, Hannes Leetaru, Edward Mehnert,Yu-Feng Lin, Keni Zhang, 2009. Integrated modeling of basin- and plume-scale processes: A scenario for full-scale deployment of geologic carbon sequestration in the Illinois Basin, *Ground Water* (in review).

J2 Jens T. Birkholzer and **Quanlin Zhou**, 2009. Basin-scale hydrological impacts of CO_2 storage: Regulatory and capacity implications, *International Journal of Greenhouse Gas Control* (in press).

J3 **Quanlin Zhou**, Sally McCraven, Julio Garcia, Monica Gasca, and Ted A. Johnson, 2009. Characterizing fate and transport of N-nitrosodimethylamine (NDMA) in a coupled surface water and groundwater system with intensive artificial recharge, *Water Research* (to be submitted)

J4 **Quanlin Zhou**, Sally McCraven, Julio Garcia, Monica Gasca, Ted A. Johnson, and William Motzer, 2009. Field evidence of biodegradation of N-Nitrosodimethylamine (NDMA) in groundwater with incidental and active recycled water recharge, *Water Research* 43(3), 793-805. [SCI Citations: 0]

J5 **Quanlin Zhou**, Jens T. Birkholzer, and Chin-Fu Tsang, 2009. A semi-analytical solution for large-scale injection-induced pressure perturbation and leakage in a laterally bounded aquifer-aquitard system, *Transport in Porous Media* 78(1), 127-148. [LBNL-1021E, SCI Citations: 0]

J6 Jens T. Birkholzer, **Quanlin Zhou**, and Chin-Fu Tsang, 2009. Large-scale impact of CO2 storage in deep saline aquifers: A sensitivity study on pressure response in stratified systems, *International Journal of Greenhouse Gas Control* 3, 181-194. [LBNL-1252E, SCI Citations: 1]

J7 **Quanlin Zhou**, Jens T. Birkholzer, Chin-Fu Tsang, and Jonny Rutqvist, 2008. A method for quick assessment of CO2 storage capacity in closed and semi-closed saline aquifers, *International Journal of Greenhouse Gas Control* 2, 626-639. [LBNL-63820, SCI Citations: 3]

J8 Jianyong Guan, Fred J Molz, **Quanlin Zhou,** Hui-Hai Liu, and Chunmiao Zheng, 2008. Behavior of the mass transfer coefficient during the MADE-2 Experiment: New insights, *Water Resources Research,* 44, W02423, doi:10.1029/2007WR006120. [LBNL-63023, SCI Citations: 2]

J9 Grace W. Su, James Jasperse, Donald Seymour, James Constantz, and **Quanlin Zhou**, 2007. Simulation analysis of pumping-induced unsaturated regions beneath a perennial river, *Water Resources Research,* 43, W08421, doi:10.1029/2006WR005389. [LBNL-63048, SCI Citations: 2]

J10 **Quanlin Zhou**, Hui-Hai Liu, Fred J. Molz, Yingqi Zhang, and Gudmundur S. Bodvarsson, 2007. Field-scale effective matrix diffusion coefficient for fractured rock: Results from literature survey, *Journal of Contaminant Hydrology* 93, 161–187. [LBNL-57368, SCI Citations: 7]

J11 Hui-Hai Liu, Yingqi Zhang, **Quanlin Zhou,** and Fred J. Molz, 2007. An Interpretation of potential scale dependence of the effective matrix diffusion coefficient, *Journal of Contaminant Hydrology* 90, 41-57. [LBNL-60744, SCI Citations: 7]

J12 Yingqi Zhang, Hui-Hai Liu, **Quanlin Zhou**, and Stefan Finsterle, 2006. Effects of diffusive property heterogeneity on effective matrix diffusion coefficient for fractured rock, *Water Resources Research* 42, W04405, doi:10.1029/2005WR004513. [LBNL-58695, SCI Citations: 3]

J13 **Quanlin Zhou**, Hui-Hai Liu, Gudmundur S. Bodvarsson, and Fred J. Molz, 2006a. Evidence of multi-process matrix diffusion in a single fracture from a field tracer test, *Transport in Porous Media* 63(3), 473 – 487, DOI: 10.1007/s11242-005-1123-9. [LBNL-58198, SCI Citations: 6]

J14 **Quanlin Zhou**, Rohit Salve, Hui-Hai Liu, Joseph Wang, and David Hudson, 2006b. Analysis of a meso-scale infiltration and water seepage test in unsaturated fractured rock: Spatial variabilities and discrete fracture patterns, *Journal of Contaminant Hydrology* 87, 96-122. [LBNL-55489, SCI Citations: 1]

J15 **Quanlin Zhou,** Jacob Bear, and Jacob Bensabat, 2005. Saltwater upconing and decay beneath a well pumping above an interface zone, *Transport in Porous Media* 61(3), 337-363. [LBNL-55486, SCI Citations: 3]

J16 **Quanlin Zhou**, Jens Birkholzer, Iraj Javandel, and Preston D. Jordan, 2004. Modeling three-dimensional groundwater flow and advective contaminant transport at a heterogeneous mountainous site in support of remediation, *Vadose Zone Journal* 3, 884–900. [LBNL-54318, SCI Citations: 2]

J17 **Quanlin Zhou**, Hui-Hai Liu, Gudmundur S. Bodvarsson, and Curtis Oldenburg, 2003. Flow and transport in unsaturated fractured rocks: effects of multiscale heterogeneity of hydrogeologic properties, *Journal of Contaminant Hydrology* 60 (1-2), 1-30. [SCI Citations: 15]

J18 **Quanlin Zhou**, Jacob Bensabat, and Jacob Bear, 2001. Accurate calculation of specific discharge in heterogeneous porous media, *Water Resources Research* 37(12), 3057-3069. [SCI Citations: 2]

J19 Jacob Bensabat, **Quanlin Zhou**, and Jacob Bear, 2000. An adaptive pathline-based particle tracking algorithm for the Eulerian-Lagrangian method, *Advances in Water Resources* 23(4), 383-397. [SCI Citations: 13]

J20 Yuansheng Zhu, and **Quanlin Zhou**, 1995. Risk analysis of flood control benefits of the Three-Gorge Project, *J. of Advances in Water Sciences (in Chinese)* 6(1), 29-35.

Book Chapters

B1 Karsten Pruess, Jens T. Birkholzer, and **Quanlin Zhou**, 2009. Mathematical models as tools for probing long-term safety of CO_2 storage, in *Developments and Innovation in Carbon Capture and Storage* (CCS) Technology (M. M. Maroto-Valer, ed.), Woodhead Publishing, Cambridge, UK (in press).

B2 Jacob Bear, and **Quanlin Zhou**, 2007. Sea water intrusion into coastal aquifers, Chapter 12 in *the Handbook of Groundwater Engineering, Second Edition*, Jacques Delleur (editor), CRC Press, Taylor & Francis Group, Boca Raton, Florida. (LBNL-63047)

B3 Hui-Hai Liu, Jonny Rutqvist, **Quanlin Zhou,** and Gudmundur S. Bodvarsson, 2004. Upscaling of normal stress-permeability relationships for fracture networks obeying fractional Levy motion, in *Elsevier Geo-Engineering Book Series Volume II, Coupled Thermo-Hydro-Mechanical-Chemical*

Processes in Geo-Systems: Fundamentals, Modeling, Experiments and Applications, by Stephansson, O., Hudson, J. A., Jing, L. (editors), Oxford, p. 263–268.

Conference Papers

C1 **Quanlin Zhou**, Jens T. Birkholzer, Hannes Leetaru, Edward Mehnert, Yu-Feng Lin, 2009. Integrated modeling of basin-scale impacts on groundwater resources and plume-scale transport behavior of geologic carbon sequestration in the Illinois sedimentary basin, *the 7th International Conference on Calibration and Reliability in Groundwater Modeling, Managing Groundwater and the Environment*, September 20-23, 2009, Wuhan, China.

C2 **Quanlin Zhou**, Lehua Pan, James Hylen, Byron G. Lundberg, Robert K. Plunkett, Stephen H. Pordes, and Stefan A. Finsterle, 2009. Modeling of multiphase diffusive processes of tritium in an underground accelerator facility, *TOUGH Symposium 2009*, Berkeley, CA, September 14-16, 2009.

C3 **Quanlin Zhou**, Jens T. Birkholzer, Hannes Leetaru, Edward Mehnert, Yu-Feng Lin, 2009 (Invited Talk). Basin-scale environmental impact of geologic carbon sequestration: Evaluation of a hypothetical scenario for full-scale deployment in the Illinois Basin, *The American Water Works Association (AWWA) Annual Meeting* in San Diego, CA, June 14-18, 2009.

C4 Jens T. Birkholzer and **Quanlin Zhou**, 2009 (Talk). Basin-scale hydrological impacts of multiple-site CO_2 storage in the Illinois Basin: Regulatory and capacity implications, *The Eighth Annual Conference on Carbon Capture & Sequestration*, Pittsburgh, PA, May 4-7, 2009.

C5 **Quanlin Zhou**, Jens T. Birkholzer, Hannes Leetaru, Edward Mehnert, Yu-Feng Lin, Keni Zhang, Preston Jordan, Scott Frailey, and Robert Finley, 2009 (Talk). Integrated modeling of basin-scale and plume-scale processes related to geologic carbon sequestration in the Illinois Basin, *The Eighth Annual Conference on Carbon Capture & Sequestration*, Pittsburgh, PA, May 4-7, 2009.

C6 **Quanlin Zhou**, Jens T. Birkholzer, Hannes Leetaru, Edward Mehnert, Yu-Feng lin, Scott Frailey, and Robert Finley, 2009 (Invited Talk). Basin-scale environmental impact of geologic carbon sequestration in the Illinois Basin, *the Symposium of Carbon Sequestration— Moving Carbon from the Atmosphere to the Lithosphere, in the 42nd Annual Meeting of the North-Central Section of the Geological Society of Americ*a, April 2-3, 2009, Rockford, Illinois, USA.

C7 **Quanlin Zhou**, Jens T. Birkholzer, Chin-Fu Tsang, Hannes Leetaru, Edward Mehnert, Keni Zhang, Preston Jordan, Scott Frailey, and Robert Finley, 2008. Modeling of basin-scale pressure perturbations induced by geological carbon sequestration in a sedimentary basin, *the Virtual Conference on Climate Change and CO_2 Storage*, December 3rd, 2008, Imperial College, London.

C8 Monica Gasca, Theodore Johnson , Sally McCraven , **Quanlin Zhou** , Julio Garcia, 2008. Natural photolysis and biodegradation of NDMA at groundwater recharge facilities that use recycled water, Los Angeles County, California, *The 21st Symposium of Groundwater Resources Association of California on Emerging Contaminants 2008*, San Jose, CA, November 19-20, 2008.

C9 Hannes Leetaru, Scott Frailey, James Damico, Edward Mehnert, Jens Birkholzer, **Quanlin Zhou**, and Preston Jordan, 2008. Understanding CO_2 plume behavior during sequestration projects through the use of reservoir fluid modeling, *the 9th International Conference on Greenhouse Gas Technologies*, November 16-20, 2008, Washington DC

C10 **Quanlin Zhou**, Jens T. Birkholzer, Chin-Fu Tsang, 2008. Environmental impact of large-scale CO_2 injection and storage in a multi-sequence aquifer-seal system: pressure propagation and brine displacement, *the Seventh Annual Conference on Carbon Capture & Sequestration*, May 5-8 2008, Pittsburgh, PA.

C11 Sally McCraven, Phyllis Stanin, **Quanlin Zhou**, 2008 (Talk). Occurrence, fate, and transport of N-Nitrosodimethylamine (NDMA) in California Groundwater, *the Sixth International Conference on Remediation of Chlorinated and Recalcitrant Compounds*, May 19-22, 2008, Monterey, CA.

C12 Sally McCraven, **Quanlin Zhou**, Julio Garcia, Monica Gasca, and Ted Johnson, 2008 (Talk). Characterizing field biodegradation of N-Nitrosodimethylamine (NDMA) in groundwater near reclaimed water recharge areas, *the Annual California WateReuse Conference*, March 24-26, 2008 Newport Beach, CA.

C13 **Quanlin Zhou**, Jens Birkholzer, Jonny Rutqvist, and Chin-Fu Tsang, 2007 (Talk). Sensitivity study of CO_2 storage capacity in brine aquifers with closed boundaries: Dependence on hydrogeologic properties, *the Sixth Annual Conference on Carbon Capture & Sequestration*, May 7-10 2007, Pittsburgh, PA.

C14 Jacob Bensabat, Jacob Bear, and **Quanlin Zhou**, 2006. Large scale modeling of seawater intrusion in a coastal aquifer: application to the North Sharon and Heffer Valley areas, Israel, *CMWR XVI - Computational Methods in Water Resources, XVI International Conference*, June 19-22, 2006, Copenhagen, Denmark.

C15 **Quanlin Zhou**, 2006. Validation of the active fracture model for unsaturated fracture flow using numerical experiments, in the *Proceedings of TOUGH Symposium 2006*, May 15-17, 2006, Berkeley, CA.

C16 **Quanlin Zhou**, Jens T. Birkholzer, Iraj Javandel, and Preston D. Jordan, 2003. Simulation of groundwater flow at the LBNL site using TOUGH2, in *Proceedings of TOUGH Symposium 2003*, May 12-14, 2003, Berkeley, California.

C17 **Quanlin Zhou**, Gudmundur S. Bodvarsson, Hui-Hai Liu, and Curtis M. Oldenburg, 2002 (Talk). Characterization of spatial variability of hydrogeologic properties for the unsaturated flow in the fractured rocks at Yucca Mountain, Nevada, in the *Proceedings of the International Groundwater Symposium on Bridging the Gap between Measurements and Modeling in Heterogeneous Media*, March 25-29, 2002, Berkeley, California

C18 **Quanlin Zhou**, Lynn W. Gelhar, and Bruce Jacobs, 2002 (Talk). Comparison of the field-scale effective properties of two-phase flow in heterogeneous porous media obtained by stochastic analysis and numerical experiments, in the *Proceedings of the International Groundwater Symposium on Bridging the Gap between Measurements and Modeling in Heterogeneous Media*, March 25-29, 2002, Berkeley, California.

C19 Jacob Bear, **Quanlin Zhou**, and Jacob Bensabat, 2001 (Talk). Three-dimensional simulation of seawater intrusion in heterogeneous aquifers: application to the coastal aquifer of Israel, in *Proceedings of the First International Conference on Saltwater Intrusion and Coastal Aquifers-Monitoring, Modeling, and Management*, April 23-25, 2001, Essaouira, Morocco.

C20 **Quanlin Zhou**, and Yuansheng Zhu, 1993 (Talk). Composite risk analysis for levee of flood plains, in *Proceedings of South and East Asia Regional Symposium on Tropic Storms and Related Flood*, 139-146, November 22-25, 1993, Guangzhou, China.

Presentations with Abstracts

P1 **Quanlin Zhou**, Fred J. Molz, Hui-Hai Liu, and Yingqi Zhang, 2008 (Talk). Scaling behavior of field-scale diffusive transport in fractured rock and porous media: A contradiction? *EOS Trans. AGU* 89(53), Fall Meet. Suppl. Abstract H31K-04, December 15-19, San Francisco, CA.

P2 Jens T. Birkholzer, **Quanlin Zhou**, Preston Jordan, Chin-Fu Tsang, Hannes Leetaru, Edward Mehnert, Scott Frailey, and Robert Finley, 2008 (Talk). A hypothetical scenario for full-scale

deployment of geological carbon sequestration: Investigating the interaction between multiple CO_2 storage sites in a sedimentary basin, *EOS Trans. AGU* 89(53), Fall Meet. Suppl. Abstract H12C-02, December 15-19, San Francisco, CA.

P3 **Quanlin Zhou**, Jens Birkholzer, Chin-Fu Tsang, Jonny Rutqvist , 2007. Quick assessment of CO_2 storage capacity in pressure-constrained saline aquifers with different hydrogeologic properties. H13F-1662, AGU Fall Meeting, December 10-14, San Francisco, CA

P4 Chin-Fu Tsang, Jens Birkholzer, **Quanlin Zhou**, 2007. Pressure propagation and brine displacement in CO_2 storage formations: The role of sealing units. H13F-1661, AGU Fall Meeting, December 10-14, San Francisco, CA.

P5 Sally McCraven, **Quanlin Zhou**, Julio Garcia, Monica Gasca, and Ted Johnson, 2007. Characterizing field biodegradation of N-nitrosodimethylamine (NDMA) in groundwater with active recycled water recharge. H33E-1696, AGU Fall Meeting, December 10-14, 2007, San Francisco, CA.

P6 Yingqi Zhang, Hui-Hai Liu, Stefan Finsterle, and **Quanlin Zhou**, 2005. How dual-scale diffusive property heterogeneity affects the effective matrix diffusion coefficient in fractured rock. AGU Fall Meeting, December 5-9, 2005, San Francisco, CA

P7 **Quanlin Zhou**, Jens T. Birkholzer, Iraj Javandel, and Preston D. Jordan, 2004. Refining a three-dimensional groundwater flow model at a heterogeneous site in support of remediation. H11C-0316, AGU Fall Meeting, December 13–17, 2004, San Francisco, CA.

P8 **Quanlin Zhou**, Gudmundur S. Bodvarsson, Hui-Hai Liu, and Curtis M. Oldenburg, 2001. Calibration of spatial variability of hydrogeologic properties in the unsaturated fractured rock at Yucca Mountain, Nevada. H31C-0259, AGU Fall Meeting, December 10–14, 2001, San Francisco, CA.